WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-111026

VOLUME 2

SERVICE MANUAL

626-PA-6014

8 CHANNEL TEMPERATURE MONITOR

4 November 1983

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TABLE OF CONTENTS

626-PA-6014 8 CHANNEL TEMPERATURE MONITOR

		Page
1	Introduction	1
2	Theory of Operation	1
2.1	Block Diagram Description	1
2.2	Detailed Circuit Description	1
3	Theory of Operation for Temperature Probe	5
4	Replaceable Parts List	6

LIST OF ILLUSTRATIONS

Figure		Page
1	6014 Block Diagram	2
2	6014 PC Board, Parts Location	10
3	626-PA-6014 (111050-G2), Schematic Diagram	11

626-PA-6014 8 CHANNEL TEMPERATURE MONITOR

1 INTRODUCTION

This manual provides maintenance instructions for the 626-PA-6014 Eight Channel Temperature Monitor Plug-in and the 626-PA-6014A Eight Channel Temperature Monitor Plug-in which are used in the Model 626 Universal Disturbance Analyzer. (The 6014 is shipped with eight temperature probes while the 6014A is shipped with between one and eight probes, as per customer order.) Included in this volume are the theory of operation, maintenance, and parts list for the 6014. For operating instructions, refer to Volume 1 of this manual.

2 THEORY OF OPERATION

2.1 Block Diagram Description

The 626-PA-6014 8 Channel Temperature Monitor is designed to monitor eight individual temperature inputs. The 6014 consists of a p.c. board plug-in (Dranetz 111045-G2) to the 626 mainframe, along with eight temperature probes (Dranetz 111059). The plug-in board and the temperature probes are discussed, in detail, separately.

As shown in the block diagram of Figure 1, the eight inputs are filtered to minimize noise entering the system. The input select circuit feeds the selected signal into the temperature measuring circuit. The precision voltage reference provides an offset current for the temperature measuring circuitry and is used to generate the system check voltages. Various decoders and switches are used to generate the IRQ signal, the A/D converter control signals, and select which signal--temperature or system check--is fed into the A/D converter.

2.2 Detailed Circuit Description

The 6014 plug-in, which is built on the universal transducer p.c. board, consists of five basic sections: program storage, control logic, multiplexer circuitry, A/D converter circuitry, and the temperature measuring circuitry. During normal operation, the eight temperature probes' outputs are alternately read, averaged, and compared for threshold and limit crossings. During a system check operation, three alternate voltages are read and printed out to verify the proper operation of the plug-in board only. The probes' accuracy can only be verified in a specially controlled environment.

2.2.1 Program Storage Section

The program storage section consists of a 4k x 8 EPROM (U1) and an 8-bit tristate buffer (U2). When the software select line MSH(not) goes low, the output of the EPROM is selected and tristate buffer U2 is turned on. The programming for the module can then be read by the CPU in the normal fashion, at $2XXX, $4XXX, ...etc., depending upon which slot the board is plugged into.

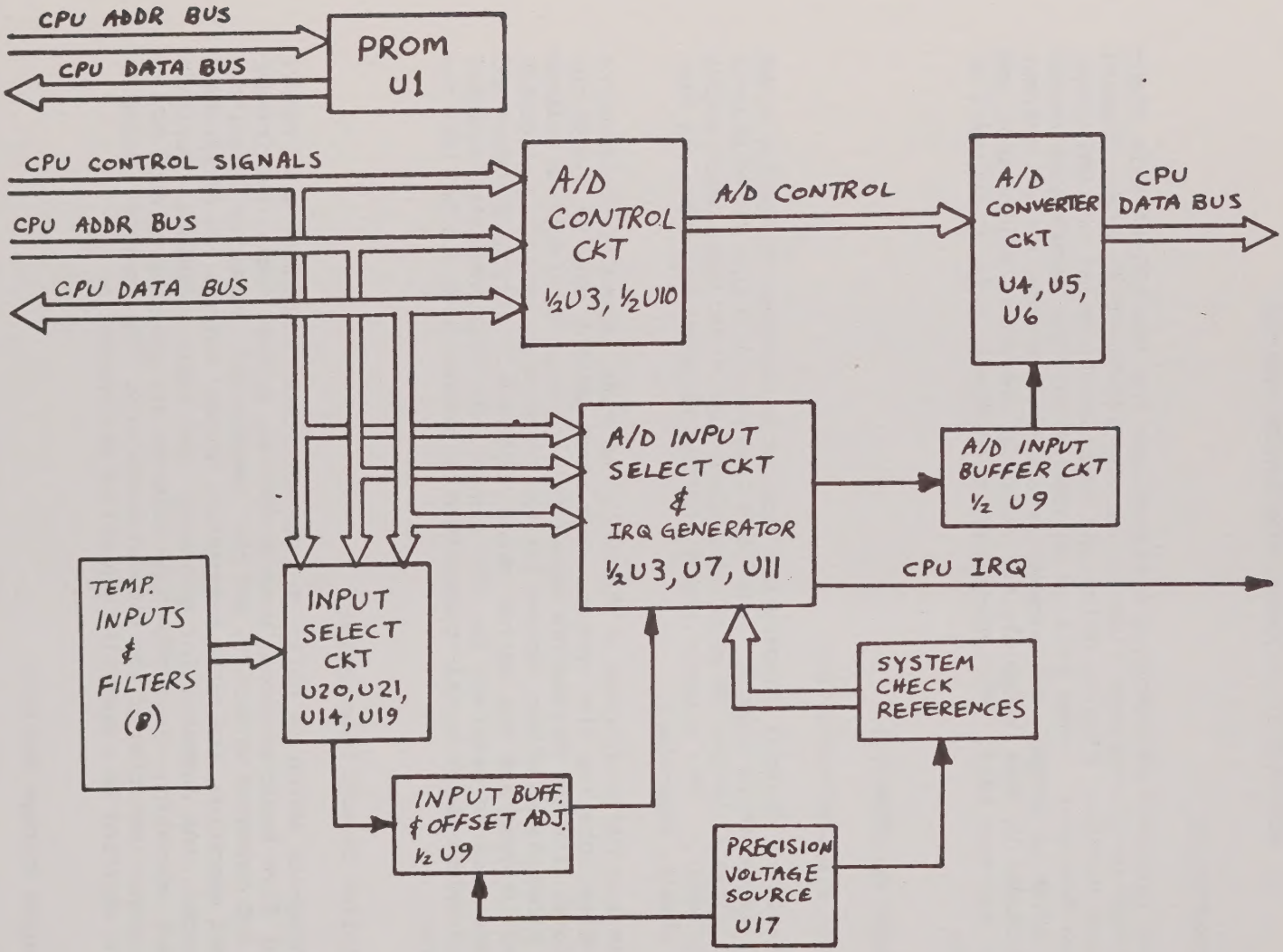


Figure 1. 6014, Block Diagram

2.2.2 Control Logic Section

The control logic section breaks the remaining available address space of the plug-in ($1000-$1FFF, $3000-$3FFF,..) into three blocks: $X00Y, $X08Y, and $X800-$XFFF. The $X00Y block is further broken down into four control words as defined in Table 1. These signals are generated by a 2-4 decoder (U3) using A0, A1, and the proper enabling signal.

Table 1
Address Code

Address	Function
$X000	Mux Latch Clock signal
$X001	Blank & Convert Strobe to ADC
$X002	MSB of ADC data
$X003	LSB of ADC data

The $X000 output of decoder U3 is fed into one-shot U10, and then ORed with the MYW signal, guaranteeing that the latch data is clocked into the 4-bit latch (U11) at the proper time--during write cycles only at approximately 400 nsec from the edge of the Phase 2 clock. The latch contains the encoded multiplexer select values in DB0 and DB1, and the IRQ state in DB7. The IRQ signal is inverted to produce the IRQ(not) signal required by the CPU. The 2 multiplexer data bits are decoded by the remaining half of U3 to produce four switch select lines, defined in Table 2, which are used to enable one switch at a time of U7.

Table 2
Data Code

DB1,0	Function
0 0	high system check point
0 1	temperature input
1 0	low system check point
1 1	ground system check point

The remaining half of one-shot U10 (address $X001) uses the RC time constant of C13 and R30 to send a Blank and Convert Strobe pulse of approximately 2.5 usec to the A/D.

The inputs of the 1-of-8 decoder (U19) are driven by a 4-bit latch (U14). The input that is to be measured is selected and activated by clocking a 3-bit Input Select Code into latch U14 with input select word $X080. Table 3 defines the input select data code for each input. The output of the decoder enables one switch at a time of U20, U21, which in turn supplies the -12 Vdc needed by the sensor for it to be active.

Table 3
Input Select Data Code

Data	Input
00	A
01	B
02	C
03	D
04	E
05	F
06	G
07	H

2.2.3 Temperature Measuring Circuit

The temperature measuring circuit uses IC temperature transducers which have an output of luA/deg Kelvin. Power is supplied to the sensor through a two-pole RLC network, and the return is filtered by an RL network to keep noise in and out of the system to a minimum. The output is scaled to -50 to 150 deg C (being equal to 0 to 9.766 Vdc) with an offset current provided by the precision 10 Vdc reference via resistors R17 and R18. Variable resistor R18 allows for any low end temperature calibration adjustment. The gain of Op Amp U9 is controlled by R19 and R20, with R20 providing the high end calibration adjustment. Capacitor C11 is placed across R19 and R20 to prevent any oscillations caused by the capacitance of the sensors' cables.

The precision 10 Vdc reference circuit uses a very low temperature coefficent zener diode into Op Amp U17 to produce the 10.00 Vdc. The divider feedback resistor network of R12-R14 is used to produce this precise reference, where variable resistor R12 allows for any necessary adjustments.

Besides feeding the temperature circuit, the 10 Vdc reference is divided by 9:1 and 1:9 using fixed resistors R22-25, and variable resistors R118 and R119. Resistor R118 adjusts the low system check voltage and R119 adjusts the high voltage. These two points, along with a ground reference, are used during the system check mode to verify that the control circuitry, 10 Vdc reference, switch networks and A/D converter section are operational. It does not check the calibration of any sensor circuit.

2.2.4 A/D Converter and MUX Circuits

During normal operation, the eight temperature signals are selected to pass through the switch of U7, through buffer Op Amp U9 then into the A/D to be converted to digital form, after which they can be read by the CPU. The U9 buffer is a unity gain amplifier with a diode clamp (CR3) on the input. The diode clamp insures that the A/D only sees positive voltages--even if a probe is removed, which may send the output of that particular circuitry to a negative value.

Upon receiving a convert signal, the A/D converts the selected input into a 10-bit digital form. The conversion generally takes 25 usec, with a software

timer trapping out if it takes too long. The A/D signals completion of the conversion by pulling the Data Ready (not) line low. This status is monitored by the CPU by reading DB7 of the MSB of the data through tristate buffer U4. The lower 2 bits (DB0, DB1) contain the high byte data of the actual data when the Data Ready line is TRUE. The remaining gates of U4 and those of U5 are used to read the lower 8 data bits of the converted data. These outputs are put on the data bus by selecting the appropriate input to decoder U3.

3 THEORY OF OPERATION for the TEMPERATURE PROBE

The temperature sensor is an IC device which has an output of 1uA/deg K and an uncalibrated accuracy of +/-1 deg K. The case of the sensor is grounded through the shield of the cable. Therefore, a polycarbonate housing, with a beryllium oxide disc mounted on the end, is used to provide complete electrical isolation. The beryllium oxide disc, which presses against the sensor, provides for good thermal conductivity to the sensor. For step changes in temperature, the housing acts as a heat sink for the sensor, causing a lag in response time of approximately a two (2) minutes. The sensor itself is unrepairable and the entire probe should be discarded if it fails.

4 REPLACEABLE PARTS LIST

The replaceable parts list identifies the replaceable parts in the plug-in. The following is presented for each such part: reference designation (if applicable), part number, manufacturer's code number, and a description. Figure 2 identifies the parts printed on circuit board A1.

REPLACEABLE PARTS LIST

626-PA-6014

Main Assembly P/N 111026

REF DESIG	PART NO.	MAN CODE NO.	DESCRIPTION
	111059	23207	Temperature Probe
	111056	23207	Temperature Probe Extension Cable

REPLACEABLE PARTS LIST

626-PA-6014

PC Board, 8 Channel Input P/N 111050-G2

REF DESIG	PART NO.	MAN CODE NO.	DESCRIPTION
C2,C4	104003-G1	23207	Cap, 10uF +/-10%, 20V
C10,C14-C17, C29,C34,C44-C52	103209-G2	23207	Cap, .22uF +/-10%, 50V
C11,C21,C23, C25,C27,C37, C39,C41,C43	104085-G2	23207	Cap, .022uF +/-10%, 250V
C12	104019-G5	23207	Cap, 330pF +/-5%,500V
C13	104023-G2	23207	Cap, 82pF +/-2%, 500V
CR2	103295	23207	Diode, Zener
CR3	104412-G2	23207	Diode
L1-L16	103580-G1		Ferrite Bead, 6uH
R11	RCR07G105J		Res, 1M +/-5%, 1/4W
R12	104719-G1	23207	Res Var, 500 +/-10%, 1/2W
R13	RN60C3571F		Res, 3.57K +/-1%, 1/8W

REPLACEABLE PARTS LIST (Cont'd)

626-PA-6014

PC Board, 8 Channel Input P/N 111050-G2

REF DESIG	PART NO.	MAN CODE NO.	DESCRIPTION
R14	RN60C6191F		Res, 6.19K +/-1%, 1/8W
R15	104719-G10	23207	Res Var, 200K +/-10%, 1/2W
R16	RCR07G561J		Res, 560 +/-5%, 1/4W
R17	RN60C4322F		Res, 43.2K +/-1%, 1/8W
R18,R20	104719-G8	23207	Res Var, 2K +/-10%, 1/2W
R19	RN60C4752F		Res, 47.5K +/-1%, 1/8W
R21	RN60C2322F		Res, 23.2K +/-1%, 1/8W
R22,R24,R26, R27	RN60C2001F		Res, 2K +/-1%, 1/8W
R30	RN60C4991F		Res, 4.99K +/-1%, 1/8W
R31	RN60C1002F		Res, 10K +/-1%, 1/8W
R32	RN60C15R0F		Res, 15 +/-1%, 1/8W
R33-R40, R42-R49	RCR07G471J		Res, 470 +/-5%, 1/4W
R118,R119	104738-G1	23207	Res Var, 200 +/-10%, 1/2W
U2	104225-G5	23207	IC, Octal Buffer
U3	104221-G7	23207	IC, Dual 1 of 4 Decoder
U4,U5	104216-G3	23207	IC, Hex Tristate Buffer
U6	104365	23207	IC, 10-Bit A/D Converter
U7,U20,U21	104362	23207	IC, Quad Analog Switch
U8,U12	104220-G4	23207	IC, Quad 2-Input OR Gate
U9	104236-G2	23207	IC, Dual Op Amp
U10	104216-G6	23207	IC, Dual Multivibrator

REPLACEABLE PARTS LIST (Cont'd)

626-PA-6014

PC Board, 8 Channel Input P/N 111050-G2

REF DESIG	PART NO.	MAN CODE NO.	DESCRIPTION
U11,U14	104202-G3	23207	IC, Quad D Latch
U13	104213-G1	23207	IC, Quad 2-Input NAND Gate
U17	104342	23207	IC, Op Amp
U19	104217-G5	23207	IC, Decoder/Demultiplexer
U33	104220-G2	23207	IC, Hex Inverter
XU1	104933	23207	IC Socket, 24 Pin
XU6	104930	23207	IC Socket, 18 Pin

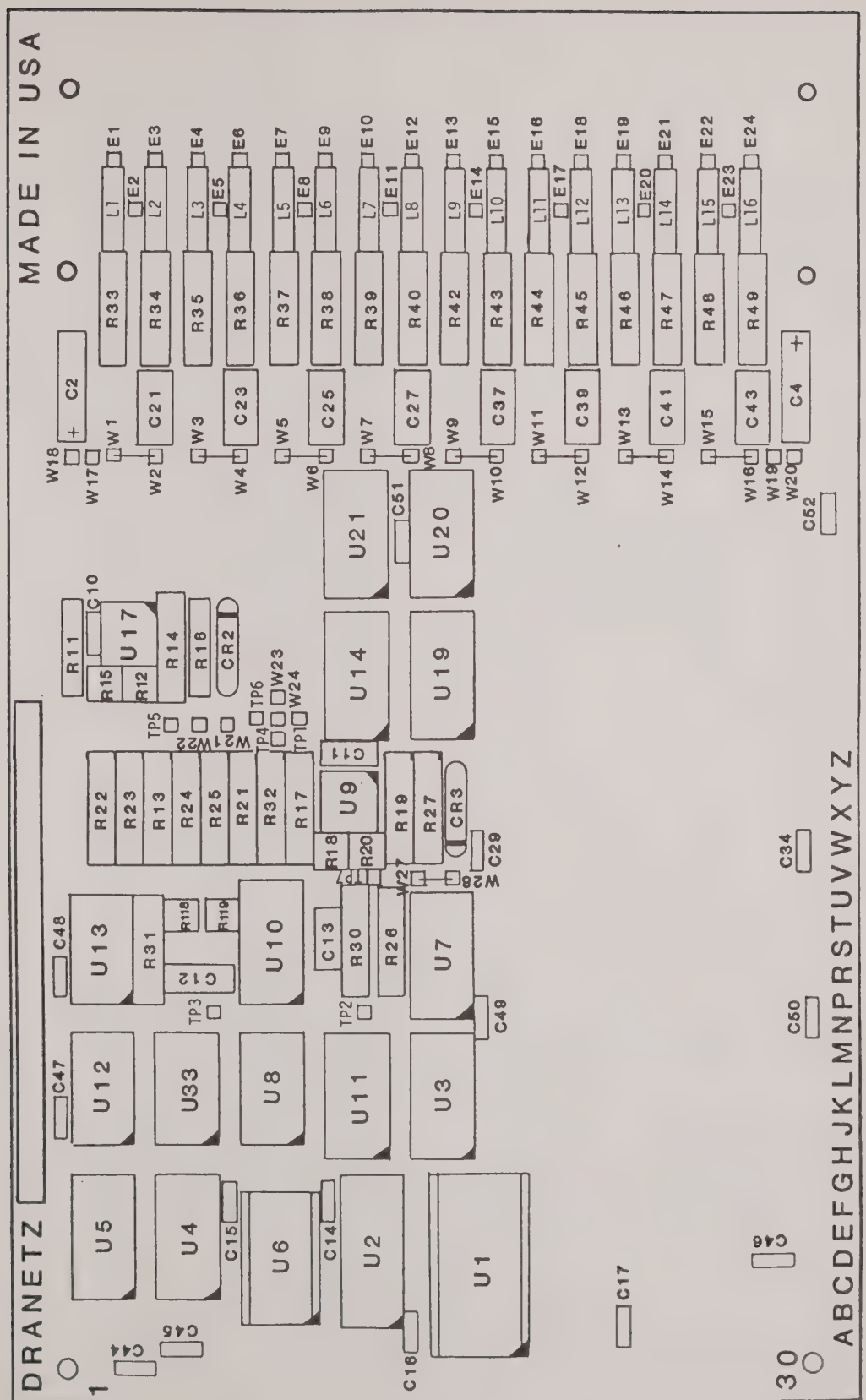
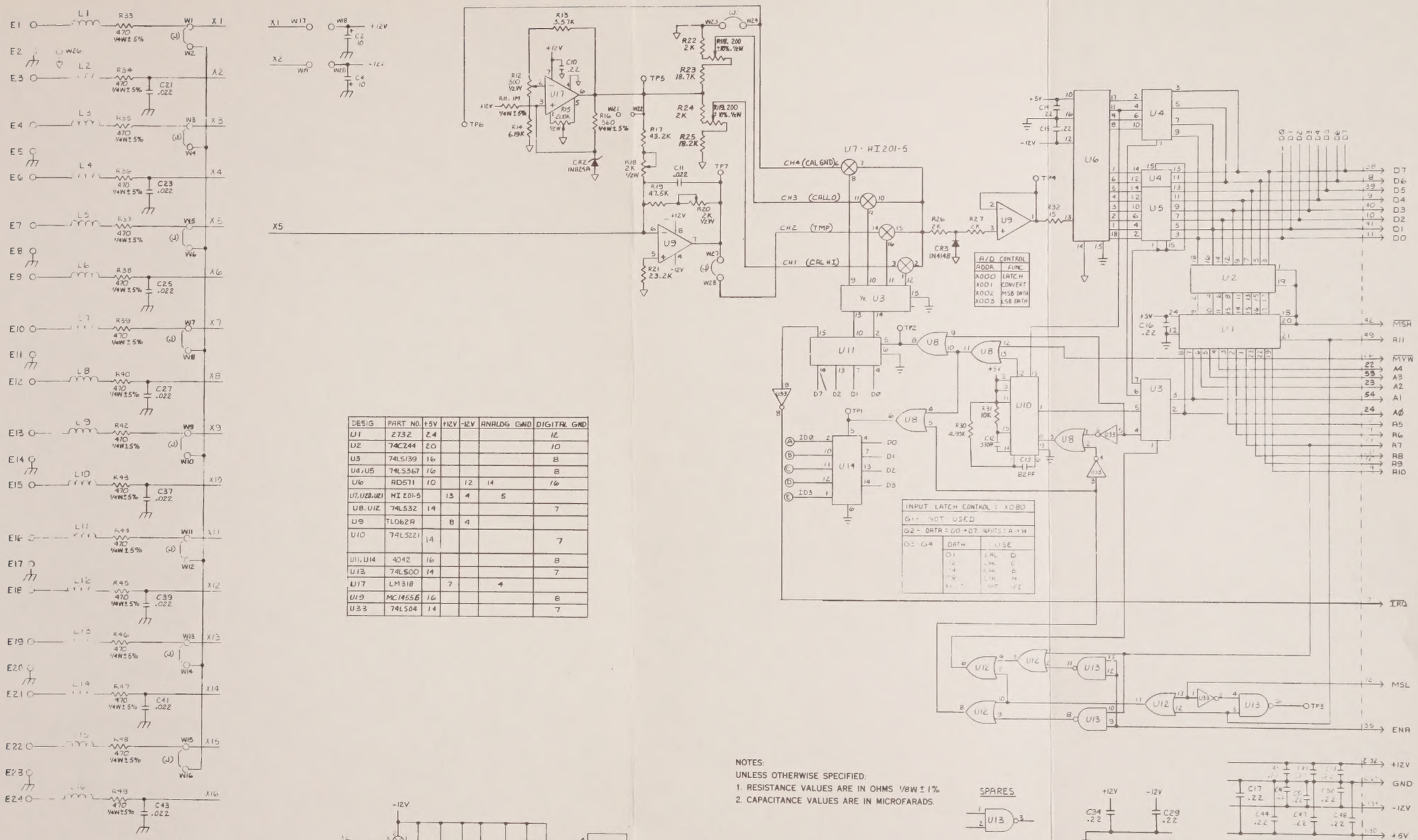


Figure 2. 6014 PC Board, Parts Location



DESIG	PART NO.	+5V	+12V	-12V	ANALOG GND	DIGITAL GND
U1	2732	24				12
U2	74C244	20				10
U3	74LS139	16				8
U4, U5	74LS367	16				8
U6	AD571	10		12	14	16
U7, U20, U21	HI 201-5		13	4	5	
U8, U12	74LS32	14				7
U9	TL062A		8	4		
U10	74LS221	14				7
U11, U14	4042	16				8
U13	74LS00	14				7
U17	LM318		7		4	
U19	MC14556	16				8
U33	74LS04	14				7

NOTES:
UNLESS OTHERWISE SPECIFIED:
1. RESISTANCE VALUES ARE IN OHMS 1/8W ± 1%.
2. CAPACITANCE VALUES ARE IN MICROFARADS.

Figure 3. 626-PA-6014 (111050-G2), Schematic Diagram

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EDISON, NEW JERSEY 08818

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(201) 287-3680
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SHIP TO: _____ INVOICE TO: _____

In Continental U. S., material will be returned by Dranetz to you by UPS, UPS Blue or other carrier chosen by Dranetz unless otherwise designated.

EQUIPMENT BEING RETURNED

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Model No. _____ S/N _____

Model No. _____ S/N _____

Ancillary equipment also being returned (If you neglect this, these items may not be returned to you).

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☐ Plug-ins (incl. S/N) _____ ☐ Connectors _____

☐ Other _____

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If so, with whom _____ Date: _____

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_____ ( )

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IMPORTANT: Repairs cannot be made unless this section is completely filled out.
(Attach added sheets if necessary)

CHECK WHERE APPLICABLE: IS MALFUNCTION RELATED TO: Warmup ☐ Temperature ☐
Intermittency ☐ Mechanical Handling ☐ Visual Defects ☐ Grounding ☐ Test Data Attached ☐

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IMPORTANT (SEE OTHER SIDE FOR INSTRUCTIONS)

IMPORTANT (ENCLOSE THIS ENTIRE FORM WITH EQUIPMENT)

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IMPORTANT: FOLLOW INSTRUCTIONS & USE THIS FORM. IT IS DESIGNED TO HELP US HELP YOU.

1. Before returning equipment to our factory, call our Customer Service Department, Tel:**(201) 287-2535** Give the model No., serial number, and information on the problem.

   A. Our specialists may be able to solve your problem rapidly without equipment return.

   B. If equipment return is needed, you will be supplied with appropriate instructions and authorization information to expedite service.

2. If return is to be made,

   A. Fill out the other side of this form COMPLETELY.

   B. Enclose original of form INSIDE the shipping carton, preferably attached by masking tape to the equipment.

   C. Ship prepaid (including insurance); we will return prepaid unless otherwise advised by you.

   D. IMPORTANT - PACK PROPERLY! SHIPPING DAMAGE WILL BE CHARGED TO YOU!

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